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THEORY AND PRACTICE

OF

MALTING

AND

BREWING.

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BY A PRACTICAL BREWER.

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## P R E F A C E.

THE great importance of having Malt Liquors salubrious has induced the author to publish the following sheets.

It has been long thought that the business of Brewing might be conducted by illiterate people, and consequently it has sometimes been undertaken by old women, ostlers of Inns, cooks, and other persons of no education ; time, however, has shewn how ill qualified such people are for the business, and the Liquors they produce are generally defective in some respect or other.

To enable the Nobility and Gentry to have their Beers brewed in a proper manner and in a proper state, and likewise to instruct Gentlemen of the common Brewery in the most approved practice of Brewing, is the design of this Work published by

A PRACTICAL BREWER.



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THE  
PRACTICE AND THEORY  
OF  
MALTING AND BREWING.

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C H A P. I.

OF BARLEY.

THE figure of barley is so universally known as to need no description. It is found, by the experience of practical men, to be the most proper of all other grain for the purposes of malting.

It is generally sown in the months of April or May, respect being had to the nature of the soil on which it is to grow: It ripens about the end of August or beginning

A of

of September, and is housed after being somewhat dried in the shocks.

In unfavourable seasons the barley does not ripen equally, and the different ripeness of the corns is discernable by the eye. When housed too soon, which is often the case in wet harvests, the unripe corns, by means of the moisture they still retain, communicate a heat to the mow, a fermentation ensues, and the corns of the barley become discoloured; which, had the barley been well dried in the shocks, would have evaporated.

Such barley the brewer, who would not be disappointed in his business, must always avoid, as this grain can never make good malt, and the beers brewed from it will neither be bright nor strong.

But barley which has been duly dried in the shocks, and housed in good condition, generates of itself a gentle heat in the mow, and sweats within due bounds.

This



This barley will shew a sample of an uniform colour and clear lively appearance.

Barley thus got, and not allowed to heat in the chaff, to which by the bye it is very prone, is the most preferable for malting, especially if it has been produced on a light chalk soil.

The gentle sweating in the mow, which the barley undergoes, tends greatly to assist its malting ; and I would never recommend the barley which has not been sweated in this manner a due time.

Some maltsters, when they wish to have new malt early to market, perhaps to obtain a great price, have the barley threshed from the shocks. This new barley does not imbibe the water in the steeping cistern so equally as that which has been sweated in the mow a due time, and, in consequence, does become so equally malted ;

the progress of the acrospire\*, while germinating, will be quicker in some corns than in others ; some will even be but half malted, while others are so forward as to be ready for the curing or drying : But, as this interferes with the third part of this work, I shall refer the farther description of the state and appearances of barley when malted ; and shall now proceed to the consideration of water and its different qualities, shewing what water is fittest for the maltster and brewer.

\* The acrospire is a technical appellation given by maltsters to the shoot of the corn while confined to the body of the grain.

## C H A P. II.

## OF WATER.

WATER, though a simple fluid, and daily the object of our senses, is nevertheless little understood, nor are even the generality of maltsters and brewers very solicitous to procure the best.

The lightest is the purest and most free from any mixtures. The purest water we have is what is collected on the tops of high hills, at a distance from the smoke of cities,

This water appears to be the fittest menstruum for the purposes of malting and brewing, readily penetrating the thick skins of the barley, and an excellent solvent of the meal of the malt. But, as it is impracticable to procure this water, which, as well as rain water, the next in purity,

purity, is so seldom to be collected in sufficient quantities for the purposes of malting and brewing, we are obliged to choose river water, which is the third water in point of purity, and is to be had in sufficient quantity.

River water is less liable to be loaded with, and is, in most situations, freer from, any metallic or saline substances, than spring water, and may, if your brewhouse be near the river, be easily conveyed into your vessels at a small expence.

Many people, notwithstanding, assert, that in the spring-brewings the water of rivulets, oozing through vegetables in that season, as it is loaded with the strength of the vegetables, will assist the quality of the extract of the malt. But I must contradict this, by saying that the purest water, *i. e.* the freest from any mixture, will more readily insinuate itself into the pores of the barley or malt, and be more apt to make a strong extract, than when loaded with the strength of

of vegetables; for water can take up or dissolve only a certain quantity of vegetable matter, and consequently, when it contains any, it will dissolve less than pure water will do.

The right choice of water is of the utmost importance to the brewer, more so than to the maltster, for the water is incorporated with his beer, and if good, tends greatly to increase its brightness and makes it keep longer, but if bad, vice versa.

But it will be said, neither of these waters is every where procurable in large cities. There are many wells whose waters will lather well with soap, but indeed these well waters are more fit for ale-brewing than for making a full-tasted porter. They may, in some measure, be purified by putting some unslaked lime into the well, which destroys in some degree the foreign particles which these waters generally contain. In brewhouses where these well waters are only to be had, I would recommend,

mend, as well as liming them, exposing their surface to the action of the atmosphere, by erecting a large cistern or reservoir sufficient to contain as much as the brewing requires, and letting the water remain in it for two days in winter, and one day in summer, previous to using it. If it be kept longer than the above mentioned time, it is liable to spoil and taint.

This reservoir being erected higher than the brewhouse is very convenient, gives a command of water at all times, and may be filled at leisure hours: The situation of this reservoir, with respect to the brewhouse, is shewn Fig. I. pl. I. .

## C H A P. III.

## OF MALT.

THE name of malt is given to barley after it has germinated; but the knowledge of malting is not so easily attained as many imagine. To make good malt, and cure it well, is a nice point. The most mealy plump malts are allowed to be the best; even professed maltsters differ among themselves as to the time of stopping the acrospire or shoot; this may appear strange, seeing their different malts may be tried by a simple experiment, *viz.* by cracking the corn between the teeth at the extremity; if it is hard in the smallest part of it, that corn is not duly malted or grown, and vice versa.

The time, I have found by experience, to be the most proper for stopping the progress of the acrospire, I shall point out in proper time.

B

In

In the first place, care must be taken in not purchasing barley that has been ill got in and discoloured, which you may detect upon the slightest inspection ; avoid this if you wish to succeed.

Many maltsters notwithstanding purchase this barley, who imagine, by saving two or three shillings per quarter, they have made a good bargain ; and comfort themselves by saying. " 'twill make very good small beer." But if such brewers are not totally blind to their interest, I would wish to open their eyes by telling them a story, which will shew them how they may have cheaper and better malt.

I had once dealings with a maltster, who in the end owed me some money ; he had two parcels of malt he said, made of excellent well got barley ; upon inspection of the samples, I found one sample of well made malt, the other had some hard corns in it ; he told me one half of the first kind was sold. Upon speaking of the price,

he

he said the parcels were both the same : How so, says I ? Why, says he, they are both from one field ; only that last parcel got a little rain in housing. I replied, there was half-a-guinea per quarter difference in their value to me ; he was amazed, but said, I am in your debt, and will let you have what you call the worst, whereof there are about 30 quarters at 5s. per quarter below the best, of which there are 20 quarters : We agreed.

I took the samples and made the following experiment, which I would advise every brewer to do before purchasing. I blinded my eyes, and picked out twenty-four corns of each sample, and threw them into two glasses of water : When lo ! out of the twenty-four of the worst kind, there fell nine corns to the bottom of the glass, and of the good only one. I examined the funk corns of each sample, and found none of them were bruised or chipped, because, if there are any of them bruised, they, as well as the steely or unmalted corns, will

sink, by the water insinuating itself into them.

The result of this experiment shews, that of the twenty-four of the bad sample there were more than one third unmalted, and of the good only one twentyfourth part; even in the best there may be one hard corn in twenty-four. To my loss in the buying this bad malt, there were in the proportion of nine unmalted grains in the twenty-four.

My malt was sent up, and instead of 30 quarters of the bad, 60 were received along with the good. It passed, we settled our accounts, and the thirty quarters I received overplus were brewed with the other thirty of the same kind.

Some time after I hired a man from his malt house, as I made most of the malt I brewed myself, he let me into the secret, by telling me his master had mixed ten quarters of barley with the twenty quar-

ters

ters of good malt remaining, which he told me were sold when bargaining with him, and sent this additional quantity to me along with the rest : I was amazed, but was at the same time pleased that he coincided with my opinion, that unmalted corn is the same of real barley, and indeed these thirty quarters overplus were brewed, and no difference found between their respective worts ; and those of the other thirty I bought, which I am sure had been on the malting floor, from the appearance of the hard corns being shrunk in the curing. I have related this merely to point out to those brewers who, as I formerly said, buy bad malt, what a vast saving *per annum* it may be to them both in duties and maltsters wages, seeing they may purchase good malt and add one third of good barley, which conduct will have likewise these two good consequences ; instead of two or three shillings per quarter, they will save twice the sum, and their malts will be free of mouldy or rotten corns, which perhaps are disagreeable to their delicate eyes.

Not

Not only the using of bad malt is highly detrimental to your trade, but very disagreeable to have concern with. The complaints of customers, who have a right to be well served, the desertion of some of them, and drinks returned which there is no possibility of recovering but by starting them, or mixing them with new beers, to their hurt, are the consequences.

Let your barley be at all events well got, properly and duly sweated in the mow, and have your cistern or vessel for wetting your barley in, well washed and scrubbed with a broom, in order to carry off the slime, which is very apt to be generated on the sides of it; I advise this repeatedly between every wetting.

The water should be first put into the cistern, and while the barley is descending from above, let a person in the mean time keep stirring the water with a wooden rake, which will keep the barley in motion, and separate it from the light corns and chaff, which

which will thus be made to swim a-top of the water and must be scummed off: this, being separated from the weighty barley, saves an increase of malt duties, and makes the malt shew a more cleanly sample.

Two or three days are sufficient for the water and barley to be together in the cistern, observing to run off the water and replace it with new once during that time, taking care the water should over-top the barley as long as they are together in the cistern. To judge of its being sufficiently wetted, take one of the corns endways, betwen your thumb and forefinger, and presf it, if the skin starts readily from the sides of the grain, it is enough; another way is to push an iron rod into the body of the heap, if it goes through the body of the barley pretty easy, it is reckoned sufficiently soaked.

When it is proved to be sufficiently wetted, let off the water and wash the barley with fresh water, to carry off the slime; after

ter this allow the barley to be in the cistern ten or twelve hours, to drain sufficiently; then throw it out of the cistern with wooden shovels, and lay it in a heap about thirty inches thick, where it must ly until it acquires a gentle heat, as all vegetables do when moist and in a heap. It must then be turned slowly over, and laid about half the thickness of the couch or heap as formerly; after this it is to be turned forward on the malting floor every twelve hours, or oftener in warmer weather, being careful that the heat in winter never exceeds 45 or 50 degrees. Should the heap be allowed to overheat itself, the malt will assume a bitter taste and have a bad flavour, as then the coarser oils of the barley rise, and the finer oils are destroyed.

Proceed in turning over the malt, keeping forwards from the cistern, until the a-crospire is advanced to five sixths of the corn, which will happen in about 20 or 25 days if not overheated, in which case it will happen much sooner. At this stage it must be carried

carried to the drying or withering floor, which is a floor laid in the same manner as the malting floor, but drier, being higher than the malting floor. Here it is to remain for three or four days, or until the acrospire is just preparing to shew itself at the extremity of the corn; the roots will dry very perceptibly while on this floor, where it must be turned sinartly over three or four times a day; and now the corns will become of a mealy substance, which when bruised upon a board, will resemble chalk, and is a sign of good malt.

When the malt exhibits these appearances it must be removed to the kiln to be dried or cured, where it must be gradually heated at first, not hastily, for fear that, by too sudden a heat, the fermentable qualities may be evaporated, which they are prone to be when the corns are raw; urge the fire gradually to its utmost pitch, while the malt is turned over once a-day, it will become of the hue you wish, sooner or later, in proportion to the construction of

the kiln, (I am to be understood at this time as speaking of pale malt.) Thirty-six hours are, I think, the most proper time for the malt to be on this kiln, when the heat is of a due degree.

Pale malts, that are to be kept or brewed in summer, should have rather a higher colour than those which are not intended to be kept over a season, or brewed in winter. The colour of malts is arbitrary, and differs for different beers in almost every town or country. I recommend the cinder of pitcoal burnt in covered ovens as the best fuel; wood or straw, especially if any way green or damp, communicates a disagreeable flavour to the malt, and are far from being a sweet fuel.

The haircloth floor is the most proper, in my opinion, for the pale kiln.

As soon as your malt has received the hue you desire, let it be treaded or trampled upon by mens feet while warm ; this, if

if on a haircloth floor, does not hurt or bruise the malt, and greatly assists the skreening of it afterwards, the roots being more easily broken and separated from the corns when warm than when cold.

As soon as this treading is over (for the malt must not be allowed to ly until cold upon the kiln floor, in which situation it would, especially in damp weather, attract the moist particles of the atmosphere and become raw) it must be thrown into a heap on the centre of the kiln floor, there to remain twenty-four hours, that, by not being carried hot into the granary, it may not generate malt lice and other destructive insects.

Malt should be laid at a pretty good depth in the granary, that the air may not act upon it.

Amber coloured malts are in the highest state of preservation, and as their fermentable qualities have not been destroyed

by too great a heat on the kiln, and by possessing fewer acids than paler dried malts, they form a truer sap.

The kilns for browning malts are laid with wire, brick or iron plates, and the heats applied to them are much greater than those of the pale kilns.

The malts laid on those kilns with such warm floors should have been previously dried on the pale kiln, the malt must be laid at the depth of two inches at most ; the fuel used in these kilns is beech fag-gots, with a sufficient quantity of coal cinders to keep the fire open. In browning malts, as I said in the case of pale malts, the fire must not be urged too rapidly at first, for it damages them. I do not approve of the common custom of maltsters, who in order to dry a great number of floors in a day, keep the floor of the kiln most intensely hot ; the consequence is, when a fresh floor or quantity of malt is laid on, the sudden heat destroys the most

most valuable fermentable principles of the malt.

My way is to be content with, at most, three floors a-day, and I find my malts look better and yield a more pleasant extract; whereas, by the contrary practice, the corns will blow and crack, and consequently are not capable of defending themselves from the influence of the air when laid up in granaries.

Malts should never be browned above the highest of these three known colours, which are stated by practice, a brown, a middling brown, and a high brown; if the malts are dried so high as to exceed these colours they will charr, or become full of small burnt spots. This indeed has often happened, contrary to the intention of maltsters, by the negligence of servants in turning the malts on this kiln; for, observe, when it is heated, it must be turned every quarter of an hour to dry it equally.

When

When you have dried your malts to the colour your experience in the taste of your customers may make you determine on, remove them to the granary, and when cool make them be thrown into a heap at a considerable depth, and do in every other respect as in the pale malts.

Never brew from new malts, *i. e.* malts from the kiln too short a time; they ought never to be used at a shorter period than three months, otherwise they do not yield such a pleasant and full-tasted extract, and are in every other respect unprofitable.

## C H A P. IV.

## OF HOPS.

AS in the course of this treatise I have not dived into the researches of chemists\*, I do not mean to enter on analysis of vegetables, my book being intended to be edifying to the meanest capacity.

The curious may be fully instructed in these matters by chemists; there have been practical brewers who have descanted at large on that subject, *viz.* Combrune and Richardson, who have great merit in what they have wrote.

I shall only say, that hops contain a very  
great

\* Chemists have agreed that hops contain two principles, *viz.* a fragrant oil, and an agreeable bitter gum resin, and this last acquires a bad flavour, by being exposed to long continued boiling.

great quantity of oil, which has been distinguished into two kinds, *viz.* the fragrant and the austere. The fragrant is very volatile, and by improper management in boiling may be wholly evaporated ; while the austere oils, which are raised by long continued boiling, are communicated to the beers in all their disagreeable qualities. An hour and a half, or two hours at most, are sufficient time to boil the hops with the worts, and in that time the austere oils will not have been raised, neither will many of the fragrant oils be evaporated.

The best hops for ales which are meant to have a mild flavour are the Farnham hops ; but East Kent has been generally used, not in preference to them, but because they are cheaper, the Farnham hop being dearer than commonly suits the trade of a common brewer. East Kent hops are fittest for the common brewer, and preserve themselves longer than other hops, especially if well cured by the plan-  
ter ;

ter ; in that county they are much meliorated by the sea air, and are preferable to those produced in any other county in England.

The hops used for brown beers are called brown hops ; in my practice I have found the north clays to have the superiority, as they possess a very potent bitter, and are highly proper to be used in all keeping beers. The Burton brewers buy them, for they communicate a durability to the ales, and fit them for exportation. Kentish brown hops are preferred by some, not having such a harsh bitter ; but I would advise using the north clays when they can be procured, as brown beers do not require to have so pleasant a taste as ales, and people generally prefer a sound, though harshly hopped drink, to an unsound drink at all times ; and as brown beers are generally kept a long time, their austerity is greatly corrected by age.

To preserve hops for years, lay the bags

D                      on

on their sides, and fill up the interstices pretty firmly with malt dust, pile the bags above each other in rows, continuing the malt dust to the uppermost row. The malt dust defends them from the atmosphere, and at the same time keeps them from damps, not being of itself liable to attract moisture.

Hops generally lose from ten to fifteen *per cent.* annually of their properties, but by following this method you will find your trouble well bestowed.

CHAP.

## C H A P. V.

## OF GRINDING THE MALT.

**I**N grinding the malt, it is sufficient to bruise each corn, not to reduce it to powder, otherwise you will endanger the safety of the mash by its dogging; and on the other hand, if the corns be not all broken, the whole corns give out no strength to the extract.

Be careful when grinding the malts that the flour does not make its escape, whereby you lose much of the strength of the extract: The mill should be so constructed, as that the malt shall descend into the mash leisurely through a wooden trunk, not to be carried a great way in bags or baskets and tumbled in, as is often practised.

## C H A P. VI.

## OF THE BREWHOUSE.

**T**HE different utensils in a brewhouse ought to be situated in such a manner as to avoid spilling, and at the same time to save unnecessary labour ; and as this situation is of so much consequence, I have annexed a plan of a brewhouse.

The cold liquor \* pump AA raises the water from the river or well B, which, as well as the wort pump MM, is driven by a horse ; which horse, by the aid of proper machinery, likewise grinds the malt used in the brewhouse : The grinding house is situated between the pumps, as may be seen by the mill spout P, which conducts

the

\* Brewers call water, whether warm or cold, *liquor* ; it being a fine among them to use the word water.

the malt from the mill into the mash tun H. The liquor from the river B is pumped into the cistern or reservoir C, where it is ready at all times during the hurry of brewing, and from the cistern it passes through the large pipe D into the liquor copper E, where it may be stopped by a cock at the extremity of the pipe. The liquor, when warmed for mashing, is let into the mash tun H, by opening the cock F in the bottom of the copper, and runs down the trunk Z, which carries it into the raising spout G in the mash tun H; this spout, by a notch in the moveable or false bottoms of the mash tun, conducts the liquor between the moveable and real bottoms, which by ascending assists the mashing very much.

The extract or wort is let go by turning the cock K into the underback L, and is from thence carried by the horse pump MM unto a level with the wort copper O, and runs from the pump through the pipe NN into the wort copper.

When

When cold liquor is required for mashing, as is the case in small beer brewing, it is had from the cistern C by the pipe Q, which communicates with it.

Thus these three very laborious parts of the business, *viz.* pumping the liquor from the river or well, mashing and pumping up the worts into the copper, may be easily performed by two men, and they are able to mash a very considerable quantity of malt, and attend to the steeming of casks, liquoring the backs, &c. between mashes.

When all the worts are in the great copper O, and are boiled sufficiently, they are run off into the first back T, by turning the cock R, the spout W conducting the worts into the drainer S, which detains the hops; this back communicates with the two large backs YY, which are sufficient to contain all the worts, and they may be laid at a greater or less depth, by using one or both of these backs, stopping either

either of the pipes X, by putting in one of the plugs UU ; the situation of these two backs is higher than the fermenting tuns, and by pipes the worts are conveyed into them below, and if there is conveniency the tuns, when cleansing \*, ought to be high enough to fill the casks in the cellars, by means of a leatherne pipe. This brewing proceſſ is carried on easily throughout, and with pleasure, the utensils bēing ſo ſituated as to do all the work themſelves.

\* *Cleansing* denotes filling the casks from the fermenting tuns ; it is ſometimes called *taking up the tun*.

## C H A P. VII.

## OF BREWING.

HAVING procured my malt of the best quality, such as I recommended when treating on that subject, I proceed now to the process of brewing.

In the first place, I have my coppers scoured bright and well washed out the day before brewing, and my liquor in the liquor copper brought to boil; then, by means of the pipe and cock from the reservoir, I procure cold liquor, to temper or bring the warm liquor down to the heat I require it for the first mash of this brewing, which I intend shall be small beer, my malt is next to amber in colour. I prefer this to paler malts for small beer, especially, as by its higher hue it gives  
the

the beer a good shew in the glass, the higher colour aiding the transparency.

I here mention no quantities of malt or hops, because at the conclusion of this work I have laid down two actual brewings of small beer, as I have done likewise of ale and porter ; I made two of each, because the process of brewing in the two different seasons is not conducted in the same manner, and this is owing to the beers of their respective seasons being designed to be kept in different temperatures.

Having got my mash tun well washed while my liquor is heating, I let the liquor into the tun by the rising spout, and it descends to the bottom of the tun and ascends until it is in quantity sufficient for the malt ; I take the depth, and if just, I make my miller send down the ground malt through the mill spout into the mash tun : Whilst the malt is descending into the liquor, I cause my men, with rakes or

E                      paddles,

paddles, mix the malt and liquor together ; the rakes are preferred to oars in the first mash, the malt being then dry, as by their horizontal motion they are not so apt to scatter the flour of the malt. When the malt is thoroughly wetted the oars are made use of, which raise the malt from the bottom of the mash, and mix or blend it with the liquor. The time for using the oars is in proportion to the quantity of malt ; if under five quarters, a quarter of an hour is sufficient ; the larger the body of malt the more mashing is necessary, the quantity, if great, does not so easily get wetted, and can suffer more work, as it is not so liable to lose the designed heat as a smaller quantity ; when masked it is to be covered up with a little dry malt, which the miller must detain from the mash on purpose, this retains the heat in the mash, and consequently assists the properly extracting the malt.

Now I take my first observation by means of a thermometer, whose stem is so

so long that the bulb reaches to the middle of the mash; there I leave it standing till the time of running off the extract, or, as brewers term it, slackening; I note down the heat at this time, and as this first mash stands three hours in winter and two in summer, I take another observation in the intermediate space, and a third at the time of slackening; which plan of conduct I recommend to every brewer until he can, by practising this and observing the heat, know what will be the heat of the mash, which I have myself arrived at.—While this mashing was performing, the liquor from the reservoir was running into the liquor copper, and a good fire put to it which has brought it to the heat of  $175^{\circ}$ \*.

It is a piece of good conduct in brewers to time these necessary parts of the business well: I have now in my liquor copper liquor sufficient to wash my under-

E 2 back.

\* When speaking of the degrees of heat on the scale of the thermometer, I am all along to be understood as using Fahrenheit's.

back, my coolers and tuns, I stem my cocks likewise at this time, which is performed by putting a little warm liquor in them and bunging them; this softens them, and assists much the washing or rinsing of them afterwards.

When the mash is slacked, we have enough of liquor in the copper, which we apply a good fire to.

When my mash is half spent I apply my thermometer to the worts at the cock of the underback, and find there are only three degrees of difference between this observation and the one I made when just slackening, my thermometer being then in the mash. This is a true sign of good malt and of a fair mash; bad malt causes the heat of the mash to vary considerably, and the variation is in proportion to the number of hard corns in the mash.

As soon as my liquor is reduced to the proper heat, and the mash tun run, I let it on

on the malt and wash it with oars half an hour, and let it stand half an hour longer, in which time the worts from the underback are ascending into the wort copper, and are the first worts. A fire must be immediately put to the wort copper to heat the worts, just as much as to keep them from fading, as I boil none until all my length or quantity of worts are up from the underback. In an hour hence the mash is again spending, and when run I mash again with cold liquor from the reservoir, and mash it with the oars one quarter of an hour, and allow it to stand three quarters of an hour more in winter, and one quarter in summer. I then slack, and have up this third and last wort in the copper among the former worts. I now add my hops, that they may be well wetted and broke among the worts before they boil. This ought always to be done in putting in the hops into strong as well as into weak malt liquor brewing. The hops, by this treatment, give the worts a better flavour than when thrown into a wort  
that

that is boiling furiously. I only make three mashes for small beer, and I find my beer more palatable on that account ; over-mashing the malt has the same bad effect as overboiling the hops, it gives the beer an austere taste ; some people make four or five mashes, which I disapprove of.

I boil my worts in summer three hours, and in winter two, so use less liquor in winter than in summer to make the worts of the same strength. The waste of the worts by boiling may be easily ascertained by practice, I think small beer loses nearly one barrel an hour, but this varies in proportion to the construction of the copper.\*

The

\* In boiling, a considerable steam arises in the copper, which is pure water mixed with the finest and most fragrant oils of the hops, which cannot by any means be entirely condensed. An invention of a brewer was published some years ago, to condense the steam of the worts when boiling, meaning to retain the volatile oils of the hops in the body of the worts. It was in this manner ; he erected a circular cover or dome on his wort copper, and had a large pipe fixed upright in

The boiling of the small beer worts must, as well as strong worts, be performed as violently as they will bear without frying, which is caused by an overviolent fire.

When boiled to the term required, the worts are let off into the coolers, and laid at a depth greater in winter than in summer, in which last season they should barely cover the backs ; the sooner they are cool, and fit to be put to ferment, the better

in the top of the dome; the top of the pipe was inserted in the bottom of a puncheon filled with water, having a valve in the aperture at the top of the pipe, which by the force of the steam is forced up as in the case of a steam engine, the water rushes in and the steam is temperately condensed until it regained force sufficient to cause another condensation. For the satisfaction of those who may not have seen this invention, I have subjoined a plan of it, see Plate II.

But as I always prepared seeing when my strong worts broke \* in boiling, which is the sign of their being well enough, and insures their working kindly in fermentation : I never used the apparatus.

\* When worts break, they appear to consist of small detached corpuscles. The small worts never assume this appearance.

ter in summer, being apt to set or fox, in which state they are hardly capable of fermentation, and have a redish colour and most disagreeable flavour; a most unlucky circumstance when it happens in a brew-house, not being easily got the better of. When my small beer worts are cooled to the proper degree in winter, and in summer are as cold as the night air, I put them to yeast; I allow one gallon of yeast to the quarter of malt in the winter, and in the heat of summer one half gallon. In summer I put in the yeast at different times, one half of the quantity at first, and feed them with the other half until fit to be cleansed.

In winter the small beer ought to be cleansed when the head or froth is just beginning to become solid or thickened; in summer, if very hot weather, as soon as it begins to shew a white head.

When cleansed into the casks, keep them always full, as they throw over a great deal

in the fermenting ; do not fill them up with the workings over in the stillings \*, this is a bad practice, and makes the beer have a harsh greasy taste, and liable to become stale sooner than they would if they were filled from a fresh broached full cask.

As soon as your beer fines, which it will do in three weeks at most, you may then broach. If you send it out in firkins, add one fourth of new fermenting beer to it ; this will make it take a head in the casks, and sparkle in the glass if bottled.

There is nothing farther on this head to say, but to caution brewers from filling casks or utensils with new beers or worts without washing or scrubbing them well, as many do, saying, " these will do well enough, they were only once filled since washing ; " \*this is highly wrong, and en-

F                    dangers

\* The stillings are the receivers of what is worked over by the casks, and are below the casks.

dangers the cleanly taste of beers, especially in summer.

The brewing of strong ales and small beer after them is, in some respects, nearly carried on in the same manner as small beer alone, differing only in the quantity of the hops and yeast in proportion to their quality of worts, and the fermentation being carried farther.

Let your malt be of the pale kind; hops are not required in strong ales in such quantities as in porter, the superior strength of malt generally given to ales affords the preservation. Small beers are generally brewed after ales. The worts for the ale I draw off in two hot mashes, and for the small beer at one hot and one cold mash.

The quantity of yeast I allow for ale is, in winter, two gallons per quarter; and for small beer after it, one and a fourth gallon;

gallon ; in the heat of summer, one half of these quantities.

As ales require to be brewed with hotter mashes than porter or small beer, and are not allowed a great quantity of hops, the fermentation may be carried farther than in those other drinks.

In the fermentation of strong drinks, care must be taken that they have neither of these two extremes, *viz.* a yeasty and greasy flavour, or a heavy taste. The former happens when the head of the drink is suffered to fall down into the body of the must, by remaining too long in the tun after being fit to cleanse. The latter fault arises from the drink not having been long enough in the fermenting tun, to have its body sufficiently rarified or opened, or being too soon cleansed. To avoid these, I shall explain my method of conducting the fermentation of ales.

I let down my worts at their due heat,

and when they are half run down into the tun I add my yeast, which ought to be lively and brisk, the whole quantity of it at once in winter, and in summer one half at first, and one fourth at twelve hours after, and the remainder at six hours from this second feeding. When the worts begin to cream, which is the sign of their having taken with the yeast, I take a beater-in and mix them; I repeat this frequently, or when the head rises, during the tumultuous fermentation, and continue until the head rises of a solid body and yellow colour, which will rise to about two thirds of the height it was of when violently fermenting.

When this appears I desist from any beating-in, and taste the drink if it has a vinous flavour and taste and the lees readily subside, by the wort dividing itself into large flakes, I cleanse it as soon as possible into casks, without beating-in this solid head, which many practise; but I do not always approve of the custom, especially in summer. The casks

casks, as I recommended in the small beer cleansing, must be carefully kept full with clean drink during the whole time they are discharging the yeast into the stilling: If you do not fill up the casks with clean drink, but use what is in the stilling, you return the yeast into the drink, which will make it become soon stale, and at the same time prevent it from becoming so fine as it otherwise would. When the ales have worked sufficiently, and will bear bunging, let them be carefully stopt up with wooden bungs and laid in the cellars to ripen, which happens sooner or later, according to the colour of the malt and the goodness of the cellars where they are deposited.

The brewing and fermentation of brown beers differ from the two former processes, in small beer and ale. The heat of the mashes is varied according to the colour of the malt, the colour of this being arbitrary, and, like all other beers, dependent on the caprice of customers. In the brewings specified at the end of this treatise I  
have

have marked the colour of the malt, that, by the heat of the mashes there shewn, some judgement may be easily formed of the heats required for the different hues.

Where the colour of the malt is very high, or when, by excessive drying of it, there are any appearances of black spots, the heats of the mashes must be considerably lowered. By mashing these blac-kened malts very hot, the drink is impreg-nated with such a quantity of empyreumatic oil, as will make it ferment unkind-ly, and taste exceedingly coarse, and even though precipitated, when thought fit for use, will require a very long time to be fit for broaching.

As such high coloured drinks may some-times be required, it is very proper, in u-ing these brown malts, to add a propor-tion of pale malt to the mash ; the colour of the drink will not be perceptibly alter-ed by it, and will be sooner fit for use, and have a much more agreeable taste.

These

These brown malts, when brewed into a very strong porter, (brown stout) produce worts that are loaded with oil, and require a much greater quantity of yeast than any other drink. In porter, I give in winter two and a half gallons of yeast to the quarter of malt, and in summer, half of this quantity. I divide the yeast in summer, and in winter give it the whole quantity at first.

The fermentation of brown beers ought not to be so violently performed as that of ales ; they are generally designed to be kept long, and when leisurely fermented they will have a fuller taste, and preserve themselves longer.

In brown stout, or porter, the quantity of hops that is allowed is nearly the same, twelve pounds *per* quarter being the usual medium for drink that is to be kept a twelvemonth. But in those beers for exportation, the quantity is greater in proportion to the climate where they are to be

be consumed; thirty pounds *per* quarter have been used, with success, when the drink is meant to be sent into warm latitudes.

Observe, that an overhopped drink does not ferment so readily as otherwise.

C H A P.

## C H A P. VIII.

## OR CELLARS.

AS the having drinks sound, and at all times fit for use, is a desideratum of every brewer who wishes to give satisfaction to his customers, great attention in the choice of cellars is requisite. It is a very hard case, after being at much expence and trouble in forming the beers, that they should be destroyed. I have known some thousands of barrels so unfit for use when required, as not, but by starting or mixing with new beers, to be made marketable.

Perhaps there is an error, which many opulent brewers get into, of laying up more stock in the cellars than the demand requires ; for, by that management, many casks may be overlooked and become stale.

G

Cellars

Cellars ought, where there is convenience, to be below the level of the ground, as in that situation they are least liable to be affected by the changes of the temperature of the air ; and if vaulted, or arched over, they are preferable to any other cellars, if dry ; a dry cellar in this situation does not rot the casks, and has the advantage of being almost constantly of the same temperature.

The great importance of observing and having a true knowledge of the state of the drinks in the cellars, and of keeping distinct accounts of their respective ages and ripeness, has induced brewers to have cellar-men or coopers, to whom they intrust the task.

The trust is very great, and on it depend, in a great measure, the sale of the drinks and the character of the brewer.

These persons are likewise intrusted with other necessary parts of the business, fining, racking,

racking, and preserving. The different methods of treating drinks in their respective states I shall explain afterwards, and only observe here, that the age of the drink is not always the criterion of its being fit for use, and many people have been mistaken in this particular.

Opacity or cloudiness is a very disagreeable disease in beer; to overcome it, colouring has been used, which in a great degree hides the greyness of the beer, and pleases the eye; this colouring is made of calcined sugar. But as this method alters the colour and designed taste of the beer, I shall give my method of curing a butt of cloudy beer, after having shewn the origin or cause of this disease.

Beers which have been fermented with flat or stale yeast, have neither their bodies sufficiently opened, nor the spirit which well-managed beers have; they always or in most cases become cloudy.

Beers which are made of malt from barley that has been ill-housed never appear of an uniform colour, and exhibit the same difference of hue which is observable in barley that was ill got.

The only method to make the most of these beers, is to mix them with new beers, as they are, in my opinion, irrecoverable ; for I honestly confess, that my endeavours to fine them with wholesome nostrums have constantly proved abortive.

The former beers I have frequently had through my hands, and have cured them by the following method, but which indeed impairs their strength.

The butt I mean to cure, I fine with two quarts of dissolved ifinglafs, of the consistency of jelly ; this precipitant, by its wholesomeness, I prefer to all others, as the ifinglass is heavier than the beer, it falls down to the bottom of the cask, and carries along with it those floating particles which hinder

der the pellucidity of the beer. But observe to mix the precipitant with the body of the beer by means of a wooden rod, reaching only two thirds down into the cask, so as not to raise the sediment: If it does not fine in twenty-four hours, I repeat the quantity, and if it is unsuccessful still, then the beer must be racked off into a clean butt, and one gallon of strong fresh yeast, and eight gallons of boiling worts from the copper must be added to it. This yeast and worts will bring on an almost instantaneous fermentation, in which it must remain six hours. Then I bung it up tight, which heightens the fermentation, and take care, every opportunity, to give the cask vent by a peg-hole in the bung, to prevent its bursting; when this fermentation is over, the beer will begin to fine of itself; if not sufficiently fine to please the consumer, the precipitant may be again used, which will now effectually fine it.

This method of recovering this diseased beer always succeeded to my wish, but care must

must be taken to procure a very strong cask for this purpose, to insure the safety of the beer.

Another disease, very common to beers, is flatness; these beers ought not to be brought into use immediately, as time may recover them. But should they be wanted, every method that will put them upon a fret should be practised; pitching the cask upside down, which, mixing the lees with the beer again, sometimes brings on a fermentation, and in general will have the desired effect. If it have not, rack it off, and mix one eighth of new fermenting beer with it, this has ever been a sure remedy.

Ropy drinks are cured by rolling and tumbling the cask about, to endeavour to break the congealed body of them. And I mix sea salt with them in small quantities, which cuts the drink, especially if it be mixed, by rolling about the cask. If this does not entirely answer the end, I mix one eighth of new fermenting beer with them,

them, but observe to rack them off in clean casks, previous to bringing on this last fret.

Musty drinks are cured by running them through a quantity of warm boiled hops, and put upon a fret with new beers, in proportion to the musty flavour.

Drinks, when acid or stale, are softened by alkaline substances, such as limestones, chalk, and calcined oyster shells; but as these substances by absorbing the acids of the beers make it flat, it must be revived by the addition of new beer.

Some cellar-men pride themselves in having nostrums to strengthen and give the beers the taste of great age, by altering the flavour of them; but let it be observed, that these chemical compositions can never come into competition with good malt and hops, many of them are even destructive to health, and all of them change either the colour or the nature of the beers.

Beers which are intended to be long kept, are rendered fit for use, by using two quarts of isinglass dissolved in stale beer to a butt, if that quantity does not overcome the thickness, repeat the quantity in twelve hours.

Never precipitate your beers a long time before using them, it hurts their preservative properties, and flattens them; two or three days is a sufficient time previous to broaching them.

Amber and pale ales generally become spontaneously fine, and bottling them is a very great improvement, as then they are obtained at a degree of perfection unattainable while they are in the casks; the air finds admission through the seams of the casks, and even through the pores of the wood, which keeps up a constant and generally imperceptible fret. Beers when in casks can never, it is said, be at rest.

Many of these diseases of beers may be prevented,

prevented, by only using good malt and hops, and by being attentive to keep the casks and other utensils perfectly clean and sweet, than which nothing is more necessary and commendable, and experience shews, that a cleanly brewer seldom fails in having good beers.

H<sup>r</sup> C H A P.

## C H A P. IX.

## OF CASKS.

CASKS compose a very great part of a brewer's capital, and therefore their preservation requires his utmost attention.

It is as great a fault to have too many as too few of them; by being too long empty they become mouldy, and suffer much by being tumbled about in the yard, exposed to sun and rain, in somuch, that some will tell you, they suffer more when long empty than when daily used.

Some people, to preserve their casks sweet, and free from mouldiness, bung them tight with a little yeast in them, in order to have them in readiness to fill next brewing season. This may do for a month or

or two at most ; but it has this disadvantage, that should the least peg-hole be unstopt in the cask, the air finds admission, and the yeast consequently becomes putrid : These putrid casks come in, through carelessness, to be washed and filled indiscriminately with the sweet ones, to the great hurt of the brewer, and inconvenience of the consumer.

The most approved method is, by unheading the casks and washing them out perfectly clean previous to laying them up ; it is a small expence, but nothing when compared to the disadvantage of having mouldy or musty drinks returned, which, as I said before, frequently happens by the former practice.

## C H A P. X.

## ACTUAL BREWINGS OF ALE, &amp;c.

Nov. 23d 1780,—Air at 40°.

12 quarters pale malt,  
 60 libs. hops,  
 Length, 12 barrels ale, 24 barrels beer,

1st liquor at 170°.  
 20\* inches in mash tun,  
 Mashed one hour,  
 Stood two hours more,  
 Length in wort copper when  
 pumped up, - - - 6 barrels.

2d

\* It may be proper to observe here, that twice the quantity of liquor must be allowed to the first mash than what may be expected from the goods again; the dry malt imbibes almost one half of the liquor used in this mash, and retains it during the whole process; this retention is greater in proportion to the newness or high dried state of the malt used; by newness, I mean those malts which have not been long from the kiln, and have not lost the fiery particles, by not being long enough kept to become of the temperature of the air.

2d liquor at  $182^{\circ}$ .

15 inches in tun,

Mashed half an hour,

Stood half an hour more,

Length in wort copper when

pumped up, - - - 9 bs.—15.

Hops added and mashed in the worts  
20 minutes before boiling, worts broke  
in an hour and five minutes, run out of  
the copper thirteen and a half barrels  
warm worts.

1st liquor for small beer at  $150^{\circ}$ .

20 inches in mash tun,

Mashed half an hour,

Stood half an hour more,

Length in wort copper when

pumped up, - - - 12 barrels

2d liquor cold.

30 inches in mash tun,

Mashed half an hour,

Stood half an hour more,

Length in wort copper when

pumped up, - - - 18—30  
Boiled

Boiled two hours with one third of the hops which were used in the ale, run out of copper twenty-six and three fourth barrels.

The strong worts cool into 12 barrels.

The small worts into 24 ditto.

The difference in the lengths or quantities of the worts, *i. e.* unboiled worts, ought to be attended to in the course of the process, as thereby the strength of the beers is regulated. I have, I think, in this brewing shewn plainly my manner of ascertaining the lengths, which may serve in any future brewing, with the same quantity of malt, at the same season of the year. But in summer the small beer worts must be longer drawn, as they are boiled longer, *viz.* three hours instead of two.

The medium heat of the air at this season is at  $40^{\circ}$ , I allow the worts to descend to the tuns at  $50^{\circ}$ , and as they in this weather lose 5° before they take with the yeast, let it be understood I speak of my own experience

rience in a brew-house constructed according to the plan above described, the worts having to run through a pipe the distance of six yards to the tuns, whereas, in some brew-houses, they are conducted to the tuns by much longer pipes ; in such a situation they must be allowed a degree of heat equal to the distance. My worts are in the tuns at  $45^{\circ}$ , and by the heat of fermentation acquire  $10^{\circ}$  more, so that this beer is fermented at  $55^{\circ}$ . The yeast is all put into the strong worts at first, and as soon as they are taken with the yeast they are well mixed together, the beating-in is repeated as often as the head rises, and until a yeasty yellow head discovers itself. I then taste the drink ; if it appears and tastes in the manner I formerly described, I cleanse it without beating-in this head.—I broach one of the casks to fill up what the others throw out, and find by this process, that at the end of four or five months, I have a light pleasant and transparent ale.

As

As I do in the case of fermenting the strong worts, so I do in the small, allowing the whole quantity of yeast at first, and beating-in the head until it arises a little yeasty, then cleanse it and fill up the casks in the same manner as the strong.

*A Brewing of Ale and Beer 15th July  
1781,—Air at 60°.*

12 quarters malt next to amber,  
48 libs. hops,  
Length, 12 barrels ale, 24 barrels beer.

1st liquor at 175°.

Depths, &c. in mash tun and wort copper  
as last brewing,  
Stands one hour less than last brewing.

2d liquor at 190°.

Depths &c. as per last brewing,  
Stands one half hour.

Boiled with the hops added to the worts  
as per last brewing, boiled one hour as the  
worts then broke, out at thirteen and one  
fourth barrels warm worts.

1st

1st liquor for small beer at  $155^{\circ}$ .

Depths, &c. as per last brewing,  
Stands one half hour.

2d liquor cold.

Depths in mash tun 33 inches,  
Stands a quarter of an hour,

Boiled three hours, out at twenty-seven  
barrels warm worts.

The quantity of liquor for the small beer in this brewing is a little greater, being allowed one hour more boiling in this season.

The yeast for the strong and small worts must be divided, as before explained.

The strong worts are fermented as in winter, the small worts are cleansed when just creamed over. I do not use the hops for the strong worts in the small beer worts, this I do in winter only; I always choose to be at the expence of one lib. *per* quarter for the small worts in this season, which

I with

with what are remaining in the copper are sufficient.

By using fresh hops, the small beer has a more agreeable taste, and preserves itself better in this trying season.

Ales brewed in summer are not allowed so great a quantity of hops as in winter, not being required to be long kept, and are always broached as soon as fine.

The air of this season being too warm for the purposes of fermentation, the coolness of the night must be taken advantage of, in order to have the worts into the tuns at as low a degree of heat as possible.

An hour or two before sun rise is the coldest time of the day.

*A Brewing of Small Beer, Nov. 24th 1780,  
air at 40°.*

6 quarters malt next to amber,  
12 libs. hops, pale,  
Length, 30 barrels beer.

1st mash at 170°.

Mashed one half hour,  
Stood two and a half hours more,  
Length, &c. in copper when up.

2d mash at 182°.

Mashed half an hour,  
Stood half an hour more,  
Length, &c. in copper.

3d mash cold.

Mashed a quarter of an hour,  
Stood three quarters of an hour more,  
Length, &c. in copper.

Out at thirty-three barrels warm worts,  
cooled into thirty barrels, and was boiled  
two hours.

When the first worts are up, put in the hops and mash them well together, put a gentle fire to the copper, which preserves the worts from fading until all are up and made boil. Ferment, give or apply the yeast, cleanse, &c. as was directed when treating of brewing small beer in winter.

*A Brewing of Small Beer July 20th 1780,  
air at 60°.*

6 quarters of amber malt,  
15 libs. hops,  
Length, 30 barrels beer.

1st mash at 175°.

Mashed half an hour,  
Stood one and a half hour more,  
Length, &c. in copper.

2d mash at 188°.

Mashed half an hour,  
Stood half an hour more,  
Length, &c.

3d mash cold.

Mashed a quarter of an hour,  
Stood a quarter of an hour more,  
Length, &c.

Out thirty-three barrels warm worts,  
cooled into 30.

Boil these worts three hours, and cleanse,  
divide the yeast, &c. as formerly recom-  
mended.

*A Brewing of Porter Nov. 10th 1780, air  
at 40°.*

12 quarters malt dried to middling brown,  
144 lbs. hops, North clays,  
Length, 30 barrels porter.

1st mash at 165°.

Mashed 2 hours,

Stood one hour more,

Length in copper when up, 12 barrels,

Boiled one hour with one third of the  
quantity of hops, out at ten barrels warm  
worts, cooled into ten barrels.

2d mash at 180°.

Mashed one hour and a half,

Stood half an hour more,

Length in copper 12 barrels.

Boiled with one half of the hops, re-  
maining one hour and a quarter in the  
copper, out 11 barrels warm, cooled into  
10 barrels.

3d mash at 160°.

Mashed one hour,,

Stood one quarter of an hour more,

Length in copper 15 barrels.

Boiled

Boiled two hours with the remaining hops, and having the hops boiled in the former worts returned into it one hour before boiled off; out at 12 barrel warm worts, cooled into 10 and a half barrels.

The proportion of the gauges of the raw worts and what they are when boiled is greater in this last wort than in the former ones, which is owing to the vast quantities of hops which remain in the copper after each boiled wort is let off.

The method of boiling these brown worts is different from that of pale worts, each wort is boiled with the hops by itself: This is highly proper, as thereby the hops are purged of their preservative qualities, the quantity of hops in these beers being very great.

The two strongest worts do not perfectly extract the virtue of the hops; but, if returned into the last or weakest extract, the end is completely obtained.

*A Brewing' of Porter June 3d 1780, air  
at 60°.*

12 quarters of malt middling brown,  
96 lib. hops,  
Length, 30 barrels.

1st mash at 170°.

Mashed one hour and a half,  
Stood half an hour more,  
Length, &c.

2d mash at 185°.

Mashed one hour,  
Stood half an hour more,  
Length, &c.

3d mash at 165°.

Mashed half an hour,  
Stood half an hour more,  
Length, &c.

Allow liquor far more boiling to this last mash, as at this season the last worts are boiled one hour more than in winter. Ferment, &c. as directed formerly.

The heats of the mashing liquors vary in

in the different seasons, they are higher in summer than in winter, a greater degree of heat in the mash gives the beers a power of preserving them longer in that trying season.

I now conclude my treatise on malting and brewing, which I hope I have delivered in a manner more plain than any other heretofore published. I have not, in the whole course of the business, had recourse to the deep researches of chemistry, nor intermeddled in the abstruse reasonings and opinions of practical men.

What I have wrote is strengthened by a long and successful practice in malting and brewing, in which I have had the satisfaction of having my malts and beers at all seasons in the highest perfection ; and those who choose to follow the methods I have given, will have the satisfaction to find that their malts and beers will be a comfort to themselves, and a pleasure to their customers.



